

EX PARTE OR LATE FILED

DOCKET FILE COPY ORIGINAL

ANN BAVENDER*
JAMES A. CASEY
KAREN L. CASSER*
ANNE GOODWIN CRUMP*
VINCENT J. CURTIS, JR.
PAUL J. FELDMAN*
ERIC FISHMAN*
RICHARD HILDRETH
EDWARD W. HUMMERS, JR.
FRANK R. JAZZO
CHARLES H. KENNEDY*
KATHRYN A. KLEIMAN
PATRICIA A. MAHONEY
M. VERONICA PASTOR*
GEORGE PETRUTSAS
LEONARD R. RAISH
JAMES P. RILEY
MARVIN ROSENBERG
KATHLEEN VICTORY*
HOWARD M. WEISS

* NOT ADMITTED IN VIRGINIA

FLETCHER, HEALD & HILDRETH, P.L.C.

ATTORNEYS AT LAW

11th FLOOR, 1300 NORTH 17th STREET

ROSSLYN, VIRGINIA 22209-3801

(703) 812-0400

TELECOPIER

(703) 812-0486

INTERNET

HILDRETH@ATTMAIL.COM

ROBERT L. HEALD
(1956-1983)
PAUL D.P. SPEARMAN
(1936-1982)
FRANK ROBERSON
(1936-1961)
RUSSELL ROWELL
(1948-1977)

RETIRED
EDWARD F. KENEHAN
FRANK U. FLETCHER

CONSULTANT FOR INTERNATIONAL AND
INTERGOVERNMENTAL AFFAIRS
SHELDON J. KRYS
U. S. AMBASSADOR (ret.)

OF COUNSEL
EDWARD A. CAINE*

WRITER'S NUMBER
(703) 812-0480

May 16, 1995

VIA HAND DELIVERY

The Honorable Reed Hundt
Chairman, Federal Communications
Commission
1919 M Street, N.W., Room 814
Washington, D.C. 20554

RECEIVED

MAY 16 1995

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

Refs: (a) Final Report of the Commission's
Industry Advisory Committee (IAC)
on Preparation for WRC-95

(b) Commission News Release dated May 8, 1995
re WRC-95 IAC Final Report

Dear Mr. Chairman:

In its Second Notice of Inquiry in IC Docket No. 94-31, the Commission proposed that terrestrial fixed microwave service (FS) users share their current spectrum allocations with feeder links to be used by the mobile satellite services (MSS). This proposed sharing, if implemented, would have a disastrous impact on the ability of the FS users to provide microwave communications services in these bands to the railroads, pipelines, public safety, public utilities, local governments, PCS and other wireless carriers, and to private industry generally.

As indicated in reference (b) above, the IAC Final Report contains sections prepared by six Informal Working Groups (IWGs). This letter addresses the section of the Final Report prepared by one of those IWGs, specifically the section prepared by IWG-4. The purpose of this letter is to forward the attached "Statement of Non-Concurrence" on behalf of the following parties, FS users and/or equipment manufacturers:

(a) Alcatel Network Systems Inc. (Alcatel)

No. of Copies rec'd 0
List ABCDE

The Honorable Reed Hundt

May 16, 1995

Page 2

- (b) American Petroleum Institute (API)
- (c) The Associated Public Safety Communications Officials International (APCO)
- (d) Association of American Railroads (AAR)
- (e) AT&T
- (f) Harris Corporation - Farinon Division
- (g) Fixed Point-to-Point Communications Section, Network Equipment Division of the Telecommunications Industry Association (TIA)
- (h) UTC, The Telecommunications Association (UTC)

As stated above, the "Statement of Non-Concurrence" pertains to the IWG-4 Final Report portion of the IAC Final Report. In its Final Report, IWG-4 has recommended reallocating the upper 6 GHz (6.525-6.8875 GHz), the 11 GHz (10.7-11.7 GHz) and 18 GHz (17.7-19.7 GHz) bands to accommodate feeder links for the Non-Geostationary Mobile Satellite Services (NGSO MSS). If this reallocation is made, the aforementioned bands would be available to the NGSO MSS and FS users on a co-primary basis.

The FS users and equipment manufacturers strongly disagree with IWG-4's recommended sharing because these bands are already heavily used throughout the U.S. Further, the 6 and 11 GHz bands are to be the primary relocation bands for FS users that must clear the 2 GHz band to make way for PCS. Details of FS industry regarding the recommendation of IWG-4 concerns are set forth in the attached "Statement of Non-Concurrence" and already have been called to the attention of the cognizant members of the Commission's Staff.

Having made this "Statement of Non-Concurrence" FS users and manufacturers are prepared to work with the Commission Staff and the MSS interests to assist in developing U.S. proposals and positions satisfactory to all parties for use at WRC-95. Indeed, as detailed in the late filed Further Reply Comments in the IC Docket No. 94-31 proceeding,* the FS interests have provided the NGSO MSS interests with a compromise plan to resolve the spectrum sharing

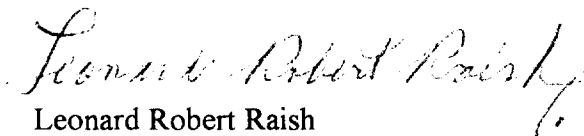
*See Attachment B below

The Honorable Reed Hundt
May 16, 1995
Page 3

problem. This compromise does not restrict the ability of NGSO MSS licensees to meet demand for their services, but it does protect the ability of FS interests to continue providing important services.

Respectfully submitted,

FLETCHER, HEALD & HILDRETH, P.L.C.



Leonard Robert Raish
For Convenience and On Behalf of the
FS interests Listed herein above

LRR:cej

Attachments

- Appendix A: Statement of Non-Concurrence
- Appendix B: Copy late filed Further Reply Comments

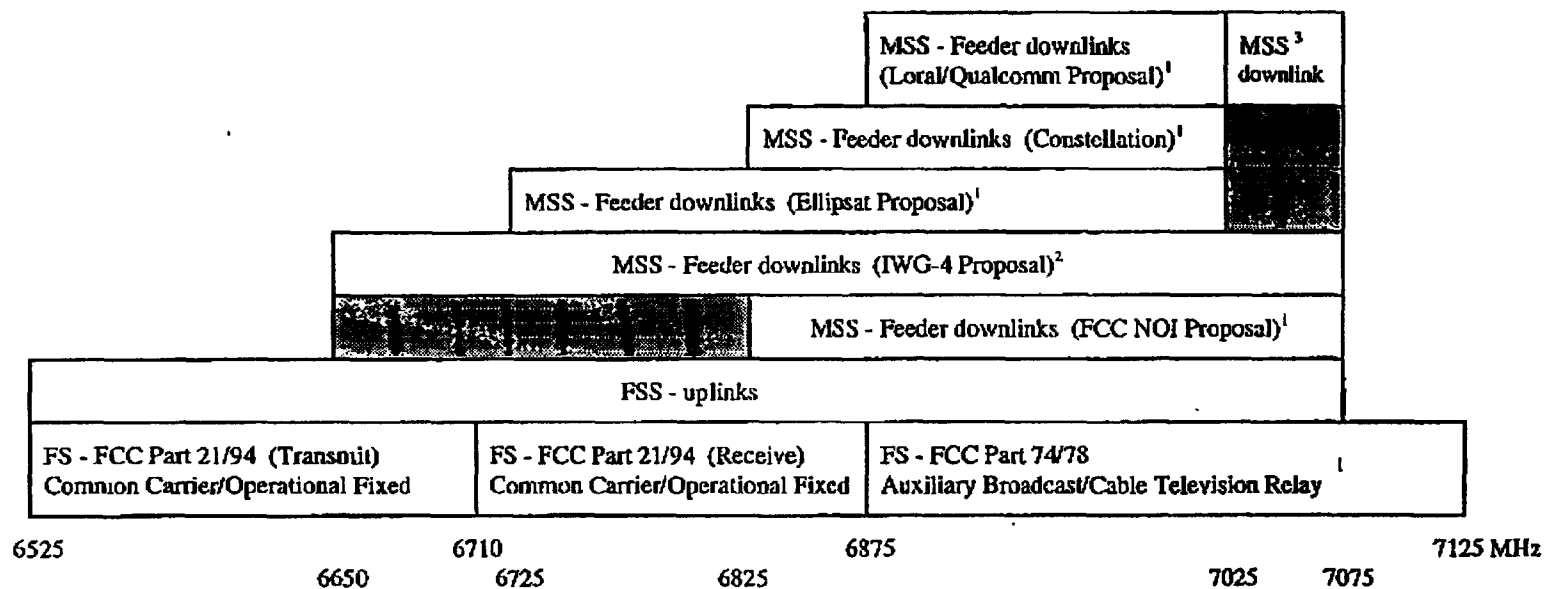
Copy To: (1) Commissioner Susan Ness (Via Hand Delivery)
(2) Mr. Scott Harris, Chief, International Bureau (Via Hand Delivery)
(3) Ms. Ruth Milkman, Chairman's Office (Via Hand Delivery)
(4) Mr. William F. Caton (For inclusion in IC Docket No. 94-31) (Via Hand Delivery)

Distribution List:

- Regina Keeney, Chief, Wireless Bureau (Via Hand Delivery)
- Daniel Phythyon, Wireless Bureau (Via Hand Delivery)
- Cecily Holiday, International Bureau (Via Hand Delivery)
- Damon Ladson, International Bureau (Via Hand Delivery)
- Alex Latker, International Bureau (Via Hand Delivery)
- Gary Epstein, Esquire (Chairman, IAC)
- Warren Richards (Dept. of State)
- Jack Wengryniuk (Chair, IWG-4)

MSS Non-Geostationary Satellite Feeder Links

Spectrum Sharing Proposals for the 6525-7125 MHz Band



References:

1. FCC Second Notice of Inquiry, IC Docket No. 94-31, Released: January 31, 1995.
2. Final Report of Informal Working Group 4, FCC Industry Advisory Committee for the ITU 1995 World Radio Conference.
3. Loral/Qualcomm also requests the 7025-7075 MHz band (source: Jay Ramasastry of Loral/Qualcomm).

MSS = Mobile Satellite Service

FSS = Fixed Satellite Service

FS = Fixed Service

Summary of Spectrum Proposals

Frequency Band	FCC NOI Proposal ^a		IWG-4 Proposal ^b	
	Uplink (MHz)	Downlink (MHz)	Uplink (MHz)	Downlink (MHz)
5.0 - 5.25 GHz	250 (160) ¹		250 (160) ¹	
6.5 - 7.1 GHz		250		425
10.7 - 11.7 GHz	500		500	
12.7 - 13.25 GHz		500		500
15.4 - 15.7 GHz	300		300	
17.7 - 20.1 GHz	300	500	1300 / 0 / 900 ²	400 / 500 / 500 ²
28.5 - 30.0 GHz	500		400 / 500 / 500 ²	

Total Spectrum	FCC NOI Proposal ^a		IWG-4 Proposal ^b	
	Uplink (MHz)	Downlink (MHz)	Uplink (MHz)	Downlink (MHz)
Requirements:				
4-8 GHz	200 / 400 ³	200 / 400 ³	200 / 400 ³	200 / 400 ³
8-16 GHz	200 / 400 ³	200 / 400 ³	200 / 400 ³	200 / 400 ³
16-30 GHz	200 / 500 ³	200 / 500 ³	250 / 500 ³	250 / 500 ³
Proposed Allocation:				
4-8 GHz	250 (160) ¹	250	250 (160) ¹	425
8-16 GHz	800	500	800	500
16-30 GHz	800	500	1700 / 500 / 1400 ²	400 / 500 / 500 ²

Notes:

1. Due to sharing limitations with MLS, only 130 to 160 MHz of clear spectrum may be available for MSS feeder links in areas of heavy MLS usage.
2. Spectrum shown is for the three IWG-4 proposals for the Ka-Band.
3. The first number is the spectrum requirement, assuming that sharing is possible between two MSS systems. The second number assumes that sharing is not possible.

References:

- a. FCC Second Notice of Inquiry, IC Docket No. 94-31, Released: January 31, 1995.
- b. Final Report of Informal Working Group 4, FCC Industry Advisory Committee for the ITU 1995 World Radio Conference.

Modulation	Theoretical C/N for 10 ⁻⁴ BER (dB) *	Typical Co-channel T/I (dB)	Theoretical Spectral Efficiency (bps/Hz)	Typical Data Input Mbps (Bands, GHz)	b, Spectrum Bandwidth† (MHz) [Symbol Rate, MBaud]	R, Spectrum Amplitude‡ (dB/4 kHz) Below the Average Tx or Rx Power
4L FSK	17.6	23.6	2	13 (18)	6.5	-32.1
QPSK, OQPSK	13.5	19.5	2	45 (18)	22.5	-37.5
9 QPR	16.5	22.5	2	6.4 (2)	3.2	-36.0
25 QPR	20.8	26.8	3.17	13 (2,10)	4.1	-27.1
16 QAM	20.9	26.9	4	90 (6,11)	22.5	-37.5
49 QPR	23.5	29.5	4	19 (2, 6, 10)	4.8	-27.8
				13 (2, 10)	3.3	-26.1
32 QAM	24.0	30.0	5	13 (2, 6)	2.6	-28.1
81 QPR	25.5	31.5	4.64	45 (2, 6)	9.7	-30.8
64 QAM	27.1	33.1	6	45 (2, 6)	7.5	-32.7
128 QAM	30.1	36.1	7	155 (6,11)	22.5	-37.5
256 QAM	32.6	38.6	8	19 (2)	2.4	-27.8
512 QAM	35.5	41.5	9	155 (6)	17.2	-36.3

† b = bit rate, Mbps / efficiency, bps/Hz
QPSK and QAM: spectra 3 dB points
QPR: spectrum central lobe width

‡ QAM/QPSK: $R = 10 \log (4 / \text{kbaud})$
QPR: $R = 3 + 10 \log (4 / \text{kbaud})$
(Assumes 4 kHz measurement bandwidth)

* See, Table 1-A, ITU-R Recommendation xxx on "Characteristics of Digital Radio-Relay Systems below about 17 GHz", (from former Report 378-6, modified).

Table B-1 — Typical Digital Microwave Noise and Spectral Characteristics.

CERTIFICATE OF SERVICE

I, Chellestine Johnson, a secretary in the law firm of Fletcher, Heald & Hildreth, P.L.C., do hereby certify that copies of the foregoing "Late Further Reply Comments" were sent this 15th day of May, 1995, by hand delivery and first-class United States mail, postage prepaid, to:

Scott Blake Harris, Esquire **(BY HAND)**
Bureau Chief
International Bureau
Federal Communications Commission
2000 M Street, N.W.
Washington, D.C. 20554

Tom Tycz **(BY HAND)**
Division Chief
Satellite & Radio Communications Division
International Bureau
Federal Communications Commission
2000 M Street, N.W.
Washington, D.C. 20554

Regina Keeney, Esquire, Chief **(BY HAND)**
Wireless Bureau
Federal Communications Commission
2025 M Street, N.W., Room 5002
Washington, D.C. 20554

William E. Kennard, Esquire **(BY HAND)**
General Counsel
Federal Communications Commission
1919 M Street, N.W., Room 614
Washington, D.C. 20554

Daniel Phythyon, Esquire **(BY HAND)**
Senior Legal Advisor
Wireless Bureau
Federal Communications Commission
2025 M Street, N.W., Room 5002
Washington, D.C. 20554

Cecily Holiday **(BY HAND)**
Deputy Division Chief
Satellite & Radio Communication Division
International Bureau
Federal Communications Commission
2000 M Street, N.W.
Washington, D.C. 20554

William Luther **(BY HAND)**
Branch Chief
Radiocommunication Policy Branch
International Bureau
Federal Communications Commission
2000 M Street, N.W.
Washington, D.C. 20554

Thomas Walsh **(BY HAND)**
International Bureau
Federal Communications Commission
2000 M Street, N.W.
Washington, D.C. 20554

Damon C. Ladson **(BY HAND)**
International Bureau
Federal Communications Commission
2000 M Street, N.W., Room 803
Washington, D.C. 20554

John Reardon, Esquire
Keller & Heckman
1001 G Street, N.W. - Suite 500W
Washington, D.C. 20001
Attorney for API

Ralph A. Haller (BY HAND)
Wireless Bureau
Federal Communications Commission
2025 M Street, N.W., Room 5002
Washington, D.C. 20554

Robert McNamara (BY HAND)
Wireless Bureau
Federal Communications Commission
2025 M Street, N.W., Room 5322
Washington, D.C. 20554

William Rummier
AT&T Bell Labs.
101 Crawford's Corner Road
Room 2E-508
Holmdel, N.J. 07733

Robert M. Gurss
Wilkes, Artis, Hedrick & Lane, Chartered
1666 K Street, N.W., #1100
Washington, D.C. 20006
Attorney for APCO

Mr. John Wengrynuik
c/o COMSAT Laboratories
22300 Comsat Drive
Clarksburg, Maryland 20871-9475

Jeffrey L. Sheldon
General Counsel
UTC
1140 Connecticut Avenue, N.W. - Suite 1140
Washington, D.C. 20036

Leslie A. Taylor
Leslie Taylor Associates
6800 Carlynn Court
Bethesda, Maryland 20817-4302
Attorney for E-SAT, Inc.

International Transcription Service, Inc.
2100 M Street, N.W.
Suite 150
Washington, D.C. 20037

Albert Halprin
Stephen Goodman
Halprin, Temple & Goodman
1100 New York Avenue, N.W.
Suite 650 East Tower
Washington, D.C. 20005
Attorney for Orbital Communications Corp.

Barry Lambergerman, Esquire
Manager, Satellite Regulatory Affairs
Motorola, Inc.
1350 I Street, N.W., Suite 400
Washington, D.C. 20005

Paul R. Rodriguez
Stephen D. Baruch
Leventhal, Senter & Lerman
2000 K Street, N.W., Suite 600
Washington, D.C. 20006
Attorneys for Starsys Global Positioning, Inc.

William R Lye
President
National Spectrum Managers Assn., Inc.
RR 7, Box 87
Fulton, New York 13069

George M. Kizer
Chairman
Fixed Point-to-Point Communications
Section Network Equipment Division of the
Telecommunications Industry Association
2500 Wilson Blvd., Suite 300
Arlington, VA 22201

Robert A. Mazer, Esquire
Rosenman & Colin
1300 19th Street, N.W., Suite 200
Washington, D.C. 20036
Attorney for Leo One USA Corporation

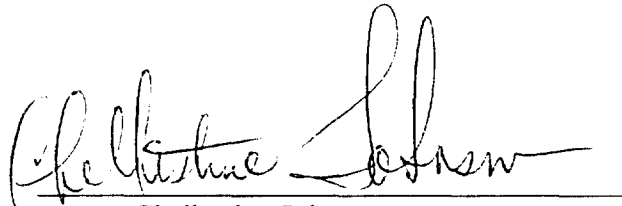
Thomas Keller, Esquire
Verner, Liipfert Bernhard
McPherson & Hand, Chartered
901 15th Street, N.W.
Suite 700
Washington, D.C. 20005-2301
Attorney for AAR

Mr. Gene Rappaport
AT&T
Room 5A-210A
900 Rte 202-206N
Bedminister, N.J. 07921

Robert J. Miller, Esquire
Jeffrey D. Jacob, Esquire
Gardere & Wynne, L.L.P.
1601 Elm Street, Suite 3000
Dallas, TX 75201
Of counsel NSMA and TIA

Denis Couillard
Manager, Regulatory Affairs
International and Domestic
Harris-Farinon Canada
3 Hotel-de-Ville
Dollard-des-Ormeaux
Quebec, Canada H9B-3G4

Mr. Jay Ramasastry
c/o LORAL/QUALCOM
1233 20th Street, N.W. - Suite 202
Washington, D.C. 20036

A handwritten signature in cursive script, reading "Chellestine Johnson", written over a horizontal line.

Chellestine Johnson

DOCKET FILE COPY ORIGINAL

RECEIVED

MAY 16 1995

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY**STATEMENT OF NON-CONCURRENCE
IN FINAL REPORT OF IWG-4**

In its Final Report, the IWG-4 recommends reallocating the upper 6 GHz (6.525-6.875 GHz), 11 GHz (10.7-11.7 GHz), and 18 GHz (17.7-19.7 GHz) bands to accommodate Non-Geostationary Mobile Satellite Services (NGSO MSS). If this reallocation is made, the upper 6 GHz, 11 GHz and 18 GHz bands would be allocated for terrestrial fixed microwave (FS) services and NGSO MSS on a co-primary basis.

FS users and equipment manufacturers strongly disagree with IWG-4's recommended sharing of these bands. These FS users are assigned the upper 6 GHz, 11 GHz and 18 GHz bands on a primary basis. The upper 6 and 11 GHz bands will be the primary relocation bands for 2 GHz users that must move to clear spectrum for PCS. Unfortunately, neither the Commission nor the WRC-95 industry working groups have evaluated the severe impact on the FS industry if these bands are reallocated for NGSO MSS feeder links. To start remedying this problem, as agreed at the April 20, 1995, meeting of the FCC Industry Advisory Committee (IAC), this Statement of Non-concurrence in the Final Report of IWG-4 is submitted on behalf of the FS interests for inclusion as an Attachment to that Final Report.

If the proposals in the IWG-4 Final Report are adopted, the impact on FS systems will be disastrous:

- Approximately 30% of the upper 6 GHz band, which already is congested and which has been allocated for FS users being displaced to clear 2 GHz spectrum for PCS, effectively would be lost due to FS channel pairing requirements.
- A comparable amount of the 11 GHz band, which also has been allocated for displaced 2 GHz FS users, likewise would be lost.
- The harmful interference from NGSO MSS feeder links to FS users and significant decrease in usable spectrum threaten public safety, utility and other FS users which require very high

path reliability of 99.999% or higher.

The assumption that the upper 6 GHz, 11 GHz and 18 GHz bands can be allocated on a shared basis for FS and for NGSO MSS feeder links is based upon several flawed conclusions in the IWG-4 Final Report:

- The IWG-4, in its Final Report, fails to accurately reflect the overall position of the Report of the Conference Preparatory Meeting ("CPM Report") regarding the highly questionable feasibility of sharing between the FS and NGSO MSS feeder links in bands which are heavily occupied by FS Services, such as the upper 6 GHz, 11 GHz and 18 GHz bands.
- The IWG-4, in its Final Report, fails to acknowledge the high density of FS usage in the upper 6 GHz, 11 GHz and 18 GHz bands, and fails to acknowledge that this congestion will be exacerbated by the relocated 2 GHz FS users.
- The IWG-4, in its Final Report, fails to recognize that the conclusions in the CPM Report rely upon data using: (i) geostationary rather than non-geostationary satellites; and (ii) bands above 10 GHz, thus excluding the heavily congested upper 6 GHz.

Under these circumstances, it is imperative that the Commission either:

- refuse to reallocate the upper 6 GHz, 11 GHz and 18 GHz bands for NGSO MSS feeder links; or
- require the FS and NGSO MSS industry groups to cooperate in selecting mutually acceptable bands for feeder links and/or in formulating restrictions on operation of such feeder links to safeguard against harmful interference to FS users; or
- defer resolution of this reallocation, at least until WRC-97, so that further study can be made to resolve the conflict.

Participants in this non-concurrence are Alcatel Network Systems Inc. (Alcatel); the American Petroleum Institute (API); the Associated Public Safety Communications Officials (APCO); the Association of American Railroads (AAR); AT&T Corp. (AT&T); Harris Corporation - Farinon Division (Harris); Fixed Point-to-Point Communications Section, Network Equipment Division of the Telecommunications Industry Association (TIA); and UTC, The

Telecommunications Association (UTC). These parties together represent manufacturing and user interests concerned with microwave spectrum allocations.

All but one of the parties listed above has filed Reply Comments in IC Docket No. 94-31 registering concerns and objections over proposals to share bands currently allocated to and used for FS systems with proposed MSS feeder links. In these Reply Comments, the FS interests object to the Commission's band sharing proposals, stating that NGSO MSS systems operating in the upper 6 GHz, 11 GHz, and 18 GHz bands would cause ruinous levels of interference to FS systems operating in the same bands.¹ Despite the opposition of FS interests to the sharing proposals being made, IWG-4 did not note or include the FS viewpoints in its Final Report.

I. Feasibility of Sharing Between FS and NGSO MSS Feeder Links Has Not Been Proven

In its Final Report, the IWG-4 identifies the upper 6, 11 and 18 GHz bands as candidates for NGSO MSS feeder links and proposes certain pfd limits for the downlinks from the satellites (Report at 12-13). In this regard, the IWG-4 states at page 16 of the Final Report: "In order to select the appropriate pfd limit, consideration should be given to the use of the band by the FS."

The above-quoted sentence, which is similar to text in the CPM Report at para. 3.6.4.8, page 58, gives the impression that the density of FS use of the band is a factor to be considered only in selecting an appropriate pfd limit for constraining the satellite downlink. Such is not the case. In the CPM Report, it is made clear in two places that occupancy of a band by the FS is a critical and unavoidable factor to be taken into account when considering possible use of a band for NGSO MSS feeder links.

First, in the context of possible interference from a NGSO MSS satellite into FS stations, "it

¹ AT&T addressed only the 11 GHz band in its Comments and Reply Comments.

may be possible to identify bands below 10 GHz which are lightly occupied by FS to accommodate non-GSO/MSS feeder links." CPM Report, para. 3.6.4.3, p. 56 (emphasis added). The implication, of course (which is ignored in the IWG-4 Report), is that bands below 10 GHz exhibiting the opposite condition, i.e., dense occupancy by FS, cannot accommodate NGSO MSS feeder links. Furthermore, this conclusion also ignores the high levels of congestion in the 11 GHz band.

In the context of interference between NGSO MSS feeder link earth stations and FS stations, it is stated in the CPM Report that "in general, sharing between FS stations and NGSO/MSS earth stations is feasible in those bands not densely occupied by the FS." CPM Report, para. 3.6.6.3, page 61 (emphasis added). Again, the clear implication in the CPM Report (also not reflected in the IWG-4 Final Report) is that sharing in bands which are densely occupied by the FS is not feasible.

II. High Density of Current and Anticipated FS Usage in Proposed Bands Precludes Sharing with NGSO MSS Feeder Links

With regard to the bands targeted for NGSO MSS feeder link use by the IWG-4 in its Final Report, the FS users are quite concerned that the high density of anticipated FS utilization resulting from the 2 GHz relocation requirements adopted by the Commission in ET Docket No. 92-9, are not considered at all. This problem will be especially acute in the upper 6 GHz and 11 GHz bands. There is no doubt that the targeted bands are now, and will be in the future, heavily used by the FS in the U.S. When the Commission reallocated the spectrum between 1850 and 2200 MHz for use by future communications services that employ emerging technologies (including PCS and MSS), it made specific arrangements for the relocation of the FS incumbents operating in that band. In its First Report and Order in ET Docket No. 92-9, 7 FCC Rcd 6886 (1992), the Commission relied on a study by its Office of Engineering and Technology (the "OET Study") which showed that

there were over 29,000 fixed microwave facilities operating in the 2 GHz band that would require relocation.² The Commission addressed the feasibility of relocating these existing 2 GHz fixed microwave users to higher frequency bands, and concluded, based on the OET Study, that the 29,000 fixed microwave stations could be relocated to higher frequency bands.³ In its Second Report and Order in ET Docket No. 92-9, 8 FCC Rcd 6495, 6506 (1993), the Commission said, "We believe that 6 GHz will be the primary relocation band for 2 GHz licensees, and therefore efficiently accommodating these licensees in this band is of utmost importance."

The expected relocation of additional FS users out of the 1850-2200 MHz bands and into the 6 GHz, 11 GHz and 18 GHz FS bands, not only in the U.S., but around the world, will certainly result in very high density utilization (by any definition of density). Therefore those bands will be unsuitable for sharing with NGSO MSS feeder links according to the guidelines and criteria of the CPM Report.

The upper 6 GHz band is preferred for low capacity FS systems and thus will be a prime candidate for the displaced 2 GHz FS users. Even before this relocation occurs, the upper 6 GHz band is heavily used, especially in urban areas. As detailed in the attached technical report, if this band is reallocated for NGSO MSS feeder links, 50 MHz, or 28%, of the upper 6 GHz band, will become unavailable for FS users due to channel pairing requirements. This problem results from ITU requiring that a maximum coordination distance of 700 km be used, and ITU requiring coordination for the entire band. Such ITU requirements would be extremely difficult to meet

² "Creating New Technology Bands for Emerging Telecommunications Technology," OET/TS 92-1, January 1992, at 18-19.

³ First Report and Order in Docket No. 92-9, supra, 7 FCC Rcd at 6889; and OET study at 35.

because it must be done over a wide range of azimuth angles.

The adverse impact on FS users in the upper 6 GHz band must be taken seriously. As detailed in Appendix A, harmful interference from NGSO MSS feeder links will cause FS performance degradation.

Microwave operators demand very high path reliability (e.g., 99.999% or higher). The microwave paths in the upper 6 GHz band may be used by state and local governments for emergency communications, electric utilities to protect their transmission networks, gas pipeline operators to control pumping stations, or cellular operators to connect switching facilities to remote base stations. These microwave operators are not using fiber optics or other leased facilities because they cannot tolerate outages due to cable cuts or other service interruptions. Intermittent outages due to satellite interference are totally unacceptable to these users.

Similarly, the availability of the 11 GHz band to FS users would be affected adversely if it is shared with NGSO MSS feeder links. As detailed by AT&T in its attached Reply Comments and in the attached technical report, with the heavy concentration of 11 GHz paths in many parts of the United States, particularly in more populous areas, introduction of MSS feeder links would make these FS systems vulnerable to harmful interference unless the satellites operate at unacceptably low power levels. In addition, NGSO MSS feeder uplinks will be difficult to frequency coordinate because of the much wider range of azimuth angles that must be considered.

III. Availability of 2 GHz MSS Service Links Would Be Decreased

The FS users also are concerned that the IWG-4, in its Final Report, does not consider the potential adverse impact of using FS frequencies for NGSO MSS feeder links upon the availability of spectrum, at least in the U.S., for MSS service links at 2 GHz. If the shared use of the 6 GHz

band for NGSO MSS feeder links results in more constraints on the FS users than they currently experience with their FS links at 2 GHz (e.g., in terms of degraded system performance, increased coordination distances, decreased flexibility for site location, etc.), then the 2 GHz FS incumbents will not be able to acquire "comparable" facilities in the 6 GHz band under the benchmark for comparability adopted two years ago by the Commission, i.e., facilities that are equal to or superior to existing facilities in the 2 GHz band in terms of reliability, throughput, overall efficiency, interference protection, and other factors.⁴ The adverse consequences of such a result would be very serious, not so much for the 2 GHz FS incumbents as for the "new technology" entities, such as the PCS and MSS providers which are planning to use the 2 GHz frequencies. This problem will occur because the requirement that the FS incumbents vacate the 1850-2200 MHz band was made specifically dependent upon the availability to them of comparable replacement facilities in higher bands.⁵ It would be ironic indeed if the insistence by the NGSO MSS proponents upon use of the 6 GHz FS spectrum for their feeder links ultimately results in the unavailability of the 2 GHz band for their own service links.⁶ Moreover, as AT&T states, coordination problems with fixed satellite service in the 11 GHz band also will exist.

To ensure flexibility in future establishment of NGSO/FSS in a given FS band and to ensure long term protection of the fixed point-to-point microwave systems, a single set of pfd limits should be used, regardless of the current usage of NGSO FSS in that band (see CPM Report at Section

⁴ Third Report and Order in ET Docket No. 92-9, 8 FCC Rcd 6589, 6603-04 (1993).

⁵ Id. at 6596, n. 17.

⁶ In the CPM Report, it is concluded that sharing between non-GSO/MSS and MSS services in the 1980-2010 MHz band is not possible. CPM Report at para. 1.4.6.2(a).

3.6.4.8, "Proposed Article 28 pfd Limits," on page 58).

With regard to what these pfd limits should be, a -154/-144dB (W/m²/4kHz) objective at 6 GHz, as proposed in the CPM Report, could have a catastrophic impact on the viability of that band for point-to-point microwave applications. Based on an Inmarsat study and a Canadian contribution to the CPM (ITU document CPM 95/22-E, dated 27 March 1995), such levels could degrade the performance of the 11,000-plus U.S. upper 6 GHz existing microwave links by 10 to 25%, depending on the choice of assumptions. When the current 2 GHz relocation will be under way and considering the sharing problems experienced at 4 GHz (3.7-4.2 GHz), 6 GHz will become the most looked after of the surviving point-to-point microwave bands. However, under such conditions, the excellent 2 GHz band cannot be replaced by 6 GHz (the Inmarsat study has also shown that 6 GHz diversity systems, likely to replace long 2 GHz links, will be more sensitive to interference than non-diversity ones).⁷ Furthermore, it may not be possible to function under these conditions and still achieve the performance objectives of ITU-R Rec.F.1092 (ITU-T Rec.G.826) which must be met by the digital radio relay systems of the future.

IV. The IWG-4 Final Report is Based Upon Invalid Assumptions

In evaluating the availability of the upper 6, 11 and 18 GHz bands for NGSO MSS feeder links, the IWG-4 has been working in a vacuum. It has been relying on MSS proponents to support the sharing of these bands with FS users. This reliance is totally misplaced because, as detailed in the attached technical report, IWG-4 uses incorrect criteria.

First, as set forth above, IWG-4 states that sharing between FSS and NGSO MSS feeder

⁷ See "Task Group 4/5 and working party 4-95 supplementary document to the CPM report", Figure 14, page 167.

links only could occur in sparsely populated bands. However, it ignores the fact that the upper 6 and 11 GHz bands are heavily used and will become even more congested when displaced 2 GHz FS users begin their forced migration.

Second, the IWG-4 Final Report is based largely upon data from fixed, rather than NGSO, satellites. It is significantly easier to coordinate FS systems and geostationary satellite links than to coordinate FS systems and NGSO MSS feeder links.

Third, the IWG-4 Final Report is based upon specific technical criteria that do not correctly represent FS systems. For example, IWG-4 uses a 20° latitude value instead of a more typical and certainly more conservative 40° latitude for FS systems location. It also uses an antenna elevation angle of 1° instead of the more conservative 3° angle that should be used.

The foregoing analysis is supported by the attached technical report, which is Appendix A.

Analysis of FCC Docket IC 94-31¹

Interference from Mobile Satellite Feeder Links Into Terrestrial Point-to-Point Microwave

Recently, the FCC, in Docket No. IC 94-31, proposed that feeder links for Mobile Satellite Services (MSS) share spectrum with the terrestrial fixed microwave (FS) services in the upper 6 GHz, 11 GHz, and 18 GHz bands.

There are two types of MSS systems -- geostationary and non-geostationary. The first type uses conventional satellites in geostationary orbit to communicate with mobiles on the ground. There are several geostationary systems currently in operation, and the FCC wants to allocate additional spectrum to this service. The second type uses a large number of satellites in non-geostationary orbits (typically 500 miles up). For example, the Motorola Iridium system proposes 66 satellites, in 6 orbital planes of 11 satellites each, with each plane separated by 60 degrees in longitude. Non-geostationary systems can carry more traffic than geostationary systems, and use lower power for the mobile transmitters.

Both MSS systems require four separate frequency bands to operate: subscriber uplinks and downlinks ("service links"), feeder uplinks, and feeder downlinks. The subscriber links communicate between the satellite and mobiles on the ground. Feeder links are used to carry traffic from the terrestrial network to satellites, to allow scarce 2 GHz frequencies to be reused in different geographical regions. MSS providers in the U.S. have proposed several different frequency bands near 2 GHz for service links, including 1.5-1.7 GHz, 2.0-2.2 GHz, and 2.48-2.5 GHz.

Proposed MSS Feeder Links in the Upper 6 GHz Band

1. Geostationary Feeder Links

Figure 1 shows the proposed feeder links in the upper 6 GHz band (6.525-6.875 GHz). The FCC wants to add geostationary satellite uplinks in the band segment from 6.725-6.875 GHz. This segment covers about half of the upper 6 GHz band. Since most point-to-point microwave systems are 2-way, and frequencies in the upper half of the band are paired with frequencies in the lower half, this proposal would affect the entire upper 6 GHz band.

Currently, the entire lower 6 GHz band (5.925-6.425 GHz) is used for FSS satellite uplinks. Terrestrial systems successfully have shared the lower 6 GHz band with FSS

¹This technical analysis was prepared by the microwave radio engineering staff of Alcatel Network Systems, Inc.

uplinks for many years. The FCC proposal for FSS uplinks in the upper 6 GHz band is identical to the current lower 6 GHz frequency sharing, and uses the same interference specifications. **As a result, frequency sharing with FSS uplinks should not present a problem in the upper 6 GHz band.**

2. Non-Geostationary Feeder Links (LEO Links)

The FCC proposed the overlapping frequency range from 6.825-7.075 GHz for non-geostationary satellite downlinks, using a new concept called "reverse band working (RBW)." RBW allows uplinks and downlinks to be transmitted within the same spectrum. The FCC proposal covers 50 MHz of the Part 21/94 upper 6 GHz band, and will affect the availability of $2 \times 50 = 100$ MHz of point-to-point spectrum (28% of the band). The FCC also is attempting to obtain 150 MHz in the adjacent Part 74/78 Broadcast Auxiliary/Cable TV Relay Band (6.875-7.125 GHz) for non-geostationary feeder downlinks. This adjacent band is used for studio-transmitter and mobile television links.

The FCC anticipates requiring additional spectrum for MSS feeder links. Therefore, if the FCC is successful in obtaining spectrum in either of the affected bands, it likely will seek reallocation of even more spectrum. It appears that more of the Part 74/78 broadcasting band is affected than the Part 21/94 point-to-point band.

Currently, three U.S. companies have been approved for non-geostationary orbit systems: Motorola, TRW, and Loral/Qualcomm. Loral/Qualcomm is the only licensee proposing to use the upper 6 GHz band for feeder links. It requested the frequency range from 6.875-7.025 GHz for downlinks, which totally avoids the Part 21/94 upper 6 GHz band. The FCC appears to have lowered the Loral/Qualcomm band edge by 50 MHz to 6.825 GHz, to obtain spectrum for "future growth."

ITU, in its Document CPM95/119-E, studied frequency sharing between terrestrial FS and non-geostationary downlinks. It concluded that sharing is possible, and that the probability of simultaneous interference from multiple satellites is low. However, the paper also stated that sharing should not be done in frequency bands with heavy use of FS. Since the non-geostationary satellite is moving, there is a much greater probability of interference into the main beam of FS.

Upper 6 GHz is becoming the preferred band for low capacity terrestrial systems in the U.S. These low capacity systems have very low receiver thresholds, which are particularly susceptible to satellite interference.

There will be relatively few earth stations in the band (e.g., 10 to 15 in the U.S.). However, these earth stations will be difficult to frequency coordinate. The ITU calculated a maximum coordination distance of 700 kilometers (435 miles) for downlinks in the 6 GHz band. Coordination will generally have to be done for the whole frequency band, over a much wider range of azimuth angles than a geostationary earth station. It will be important to site the earth stations in remote areas, with adequate terrain or man-

made shielding. As the MSS service grows, it is likely that additional earth stations will be required in the future.

Interference from non-geostationary satellite downlinks is a potentially serious problem in the upper 6 GHz band. This interference may cause unacceptable interference into existing equipment in the field. The 50 MHz of spectrum affected may become unusable in the future, impacting the frequency availability of 28% of the band. The band edge should be changed from 6.825 GHz to 6.875 GHz.

Proposed MSS Feeder Links in the 11 GHz Band

1. Geostationary Feeder Links

Figure 2 shows the proposed feeder links in the 11 GHz band (10.7-11.7 GHz).

Currently, the band segments from 10.95-11.2 and 11.45-11.7 GHz are shared with international FSS downlinks (i.e., INTELSAT). There are relatively few earth stations in the U.S., and the earth stations that do exist tend to be in remote areas well shielded by terrain. As a result, frequency coordination between terrestrial and FSS systems in the 11 GHz band has not been a problem in the past. It has been more difficult to coordinate with some recently constructed earth stations, which have been sited in urban areas (e.g., teleports). However, it is usually possible to select terrestrial frequencies in the unshared portions of the 11 GHz, when there are coordination problems.

The FCC wants to add FSS downlinks in the unshared band segments, from 10.7-10.95 and 11.2-11.45 GHz. These segments of the band will not be restricted to the international FSS service and could be used for any authorized domestic satellite use. As a result, it is likely that these segments of the band will become increasingly difficult to coordinate over time as additional earth stations are installed. This same problem has occurred in the 4 GHz band. In cases of frequency congestion, it may be possible to select terrestrial frequencies in the international satellite segments of the band.

The FCC FSS downlink proposal will place one-half of the 11 GHz band at risk of becoming another 4 GHz. Even if this occurred, there would be at least six 30 MHz channels available in the other half of the band. The 11 GHz band would not be lost, but would be more difficult to use. If this proposal cannot be blocked, restrictions on the use of the spectrum by fixed satellite users (e.g., to prevent unlicensed earth stations, like in the 4 GHz band) should be pursued.

2. Non-Geostationary Feeder Links (LEO Links)

The FCC proposes NG-MSS uplinks in the same two band segments as the geostationary downlinks described in Section 1. above. The ITU calculated the

maximum coordination distance as 415 kilometers (258 miles) for 11 GHz uplinks, which is not as severe as the 6 GHz downlinks. However, NG-MSS uplinks will be more difficult to frequency coordinate than FSS uplinks, since a much wider range of azimuth angles must be considered. Many 11 GHz terrestrial paths are in urban areas. To successfully coordinate with existing paths, earth stations may be forced into remote areas with adequate terrain shielding. This will help future terrestrial coordinations.

The non-geostationary uplink proposal will further complicate the frequency coordination of the 10.7-10.95 and 11.2-11.45 GHz band segments.

Proposed MSS Feeder Links in the 18 GHz Band

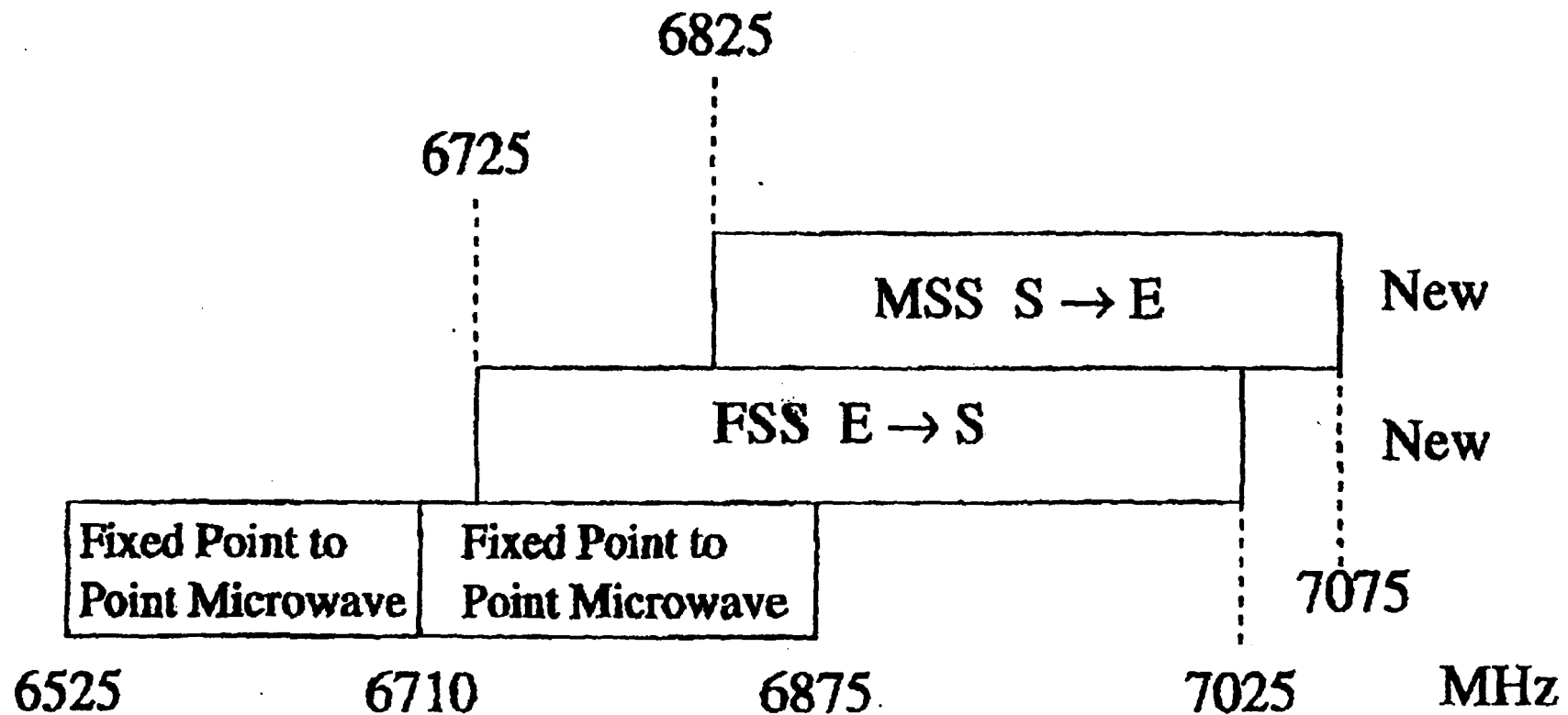
1. NG-MSS Feeder Links (LEO Links)

Figure 3 shows the proposed feeder links in the 18 GHz band (17.7-19.7 GHz).

Currently, FSS satellite downlinks are permitted between 18.8 and 19.7 GHz. The FCC proposal would allow NG-MSS uplinks between 18.9 and 19.2 GHz. This proposal would affect 35% of the 10 MHz channels in the 18 GHz band. MSS providers will probably be forced to locate earth stations outside urban areas, to avoid interference into existing 18 GHz terrestrial paths. The ITU maximum coordination distance is about 200 kilometers, or 125 miles, which is about the same as the coordination distance between terrestrial paths.

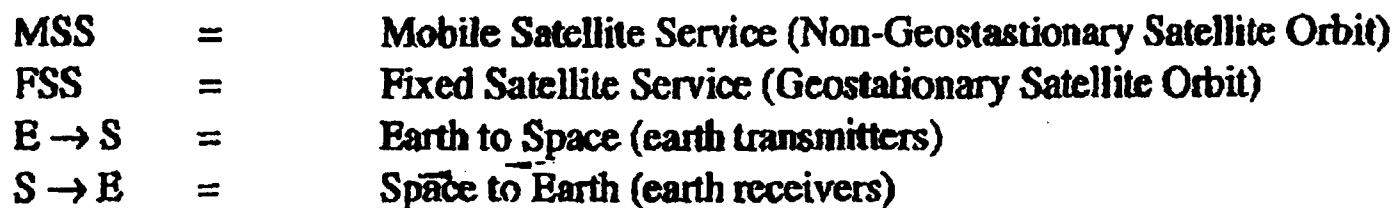
Upper 6 GHz (Part 21/94)

FIGURE 1



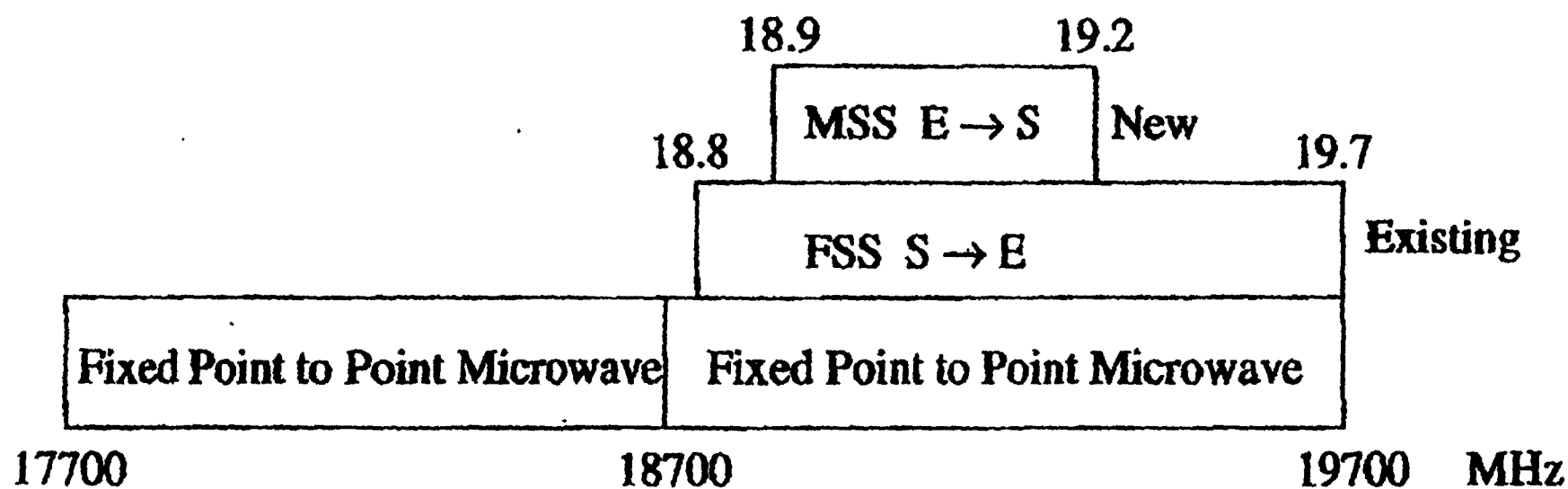
MSS	=	Mobile Satellite Service (Non-Geostationary Satellite Orbit)
FSS	=	Fixed Satellite Service (Geostationary Satellite Orbit)
E → S	=	Earth to Space (earth transmitters)
S → E	=	Space to Earth (earth receivers)

FIGURE 2



18 GHz (Part 21/94)

FIGURE 3



MSS	=	Mobile Satellite Service (Non-Geostationary Satellite Orbit)
FSS	=	Fixed Satellite Service (Geostationary Satellite Orbit)
E → S	=	Earth to Space (earth transmitters)
S → E	=	Space to Earth (earth receivers)